

Investigating the Goban Spur rifted continental margin, offshore Ireland, through integration of new seismic reflection and potential field data

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The Goban Spur, offshore Ireland, represents one of the magma-poor rifted continental margins that once lay conjugate to the Newfoundland and Labrador margin. Published studies have demonstrated that a 70-km-wide zone of exhumed serpentinized mantle lies between oceanic crust and stretched continental crust at the Goban Spur margin, although the along-strike extent of this zone has, until now, been unknown due to insufficient data coverage. Significant complexity is expected regarding the width of the different crustal zones due to the margin's complicated tectonic history. Here, six newly acquired multi-channel seismic reflection lines are processed and interpreted, along with vintage seismic profiles. These profiles reveal significant variations along strike of the Goban Spur margin, revealing different rifting stages. In the northwest, the transitional zone between the oceanic crust and stretched continental crust appears to consist of a narrow zone of shallower peridotite ridges and a wider zone of deeper exhumed serpentinized mantle, much like what is seen on the conjugate Iberian and Newfoundland margins to the south. The different types of exhumed mantle are inferred to reflect different extension rates. Toward the southeast along the Goban Spur margin, the zone of peridotite ridges appears to pinchout and is replaced by oceanic crust. By combining potential field data and seismic data, it is discovered that magmatic contributions increase from NW to SE along the Goban Spur rifted continental margin, evidenced by contrasting characteristics of the basement morphology along the seismic profiles. In total, five distinct crustal zones related to different rifting stages are identified and their regional extents assessed, significantly increasing our understanding of the Goban Spur rifted continental margin. When combined with complementary studies on the Newfoundland and Iberian conjugate margins, a clearer understanding of the rift evolution of the southern North Atlantic Ocean will be possible.